IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Reissue Application of:
BILL L. DAVIS and JESSE S. WILLIAMSON

For Reissue of U. S. Patent 5,630,363
Issued May 20, 1997
Serial No. 08/515,097

Filing Date: May 20, 1999

Serial No.: 09/315,796

For: **COMBINED LITHOGRAPHIC/ FLEXOGRAPHIC PRINTING APPARATUS AND PROCESS**

Group Art Unit: 2854

Examiner: S. Funk
J. Hilten

SUPPLEMENTAL DECLARATION OF JOHN W. BIRD

To: The Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

1. I am the same John W. Bird who executed a Declaration on December 11, 1999, and reaffirm the statements made therein.

2. Attached hereto as Exhibit A are notes taken from various days of my monthly "Pocket Day Timer(s)" for August 1994 through May 2, 1995:

**	(A)	August 18, 1994;
*	(B)	August 29, 1994;
	(C)	September 12, 1994;
**	(D)	October 5, 1994;
*	(E)	November 14, 1994;
*	(F)	November 15, 1994;
	(G)	November 18, 1994;
**	(H)	November 21, 1994;
	(I)	December 20, 1994;
	(J)	January 4, 1995;
	(K)	January 30, 1995;
**	(L)	February 9, 1995;
	(M)	February 11, 1995;
*	(N)	February 13, 1995;
	(O)	February 15, 1995;
**	(P)	February 24, 1995;
	(Q)	March 1, 1995;
*	(R)	March 7, 1995;

*	(S)	March 10, 1995
	(T)	April 4, 1995
**	(U)	April 6, 1995;
*	(V)	April 25, 1995;
**	(W)	May 2, 1995;

From my day-timer, I recall having a number of meetings at Williamson and, at other times, telephone conferences, sometimes with both Bill Davis and Jesse Williamson (marked "**" above), and sometimes with Bill Davis (marked "*"), following the revelation to me by Steven Baker of Printing Research, in late July 1994 of the Davis-Williamson process [what became the '363] see paragraph 10 of my prior declaration. The unasterisked pages may have some relevance.

3. In these meetings and conferences, which started on or about August 18, 1994, Bill Davis and/or Jesse Williamson conveyed to me details of the process they wanted implemented by a modified "rack-back" device to go upstream, together with tests they wanted run in the fall of 1994, end-of-press at the two-color experimental test press at Printing Research.

4. Specifically, among other things, they discussed (a) the resolution requirements for their flexographic plates, (b) requirements for anilox rollers, including linescreening count ranges and minimums, the availability of anilox rollers having their desired features, (c) the WIMS process (now U.S. Pat. 5,370,976), (d) the problems with the printing of metallics / whites / opaques / encapsulated essences / and various other coatings with WIMS' '976, (e) their desire that the flexographic plates be mounted to the blanket cylinder, (f) their uses of and requirements for flexographic inks, and (g) half-tone printing, all using the new process. These matters were discussed in various meetings in August 1994, and ending, as I recall, in very late 1994.

5. The information which was conveyed to me by Bill Davis and Jesse Williamson, at the dates indicated above, often came in meetings where other printing problems of Williamson Printing Corporation were also discussed, as well as at social outings. I took this information and passed it on to various PRI personnel in order to help them design the coating device suitable to accomplish Davis-Williamson's desired process. At various times, I spoke

with Ron Rendelman, sometimes Howard DeMoore, Steve Garner, Steve Baker and Dave Douglas, although Ron Rendleman was certainly the principle person to whom I discussed Williamson's specific requirements and the information given to me in the meetings indicated above.

6. The entry on February 15, 1995 mentions that UK flexographic metallic coating manufacturer Wolstenholme [International] is going to visit April 1, 1995 "onwards". On April 4, 1995 another entry occurs where metallic coating manufacturer "M.D. Both" arrives at Williamson Printing Corporation with both employees Marshall and Glass, M.D. Both are owned by Wolstenholme, and these entries relate to meetings concerned specific requirements for metallic coatings to be used in the new '363 process in order to deliver the highest brilliance.

7. The cantilevered or "ferris wheel" device started to be worked on at PRI, in earnest, in very late 1994 following the discussions from August 1994 - November 1994. I note the frequency of the meetings with both Jesse Williamson and Bill Davis starting on August 18, 1994.

8. My conference with Lapomarde (see my first declaration ¶17) and my "inkling" occurred well after I learned of the new Williamson process. By that time I had already seen the result of the Brian Liester "medieval poster" which occurred in March 1995.

9. I notice that the priority date of EP 741 025 A3, Exhibit B hereto, is May 4, 1995, which is consistent with my recollection that Printing Research filed a patent application on the cantilevered device, or "ferris wheel", in the Spring of 1995. I note the priority application is Serial No. 435,798. I did not intend to claim the Davis-Williamson process and to the best of my knowledge, no one at PRI indicated in 1995 they intended to claim the Davis-Williamson '363 process. Those '363 process aspects taught in EP 741 025 A3 – as opposed to the teachings concerning the cantilevered device or "ferris wheel" – came from the discussions with Bill Davis and/or Jesse Williamson indicated above, starting in August 1994.

The undersigned Declarant stated further that all statements made herein of Declarant's own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

John W. Bird

4.3.00

Date:

Exhibit "A"

THURSDAY

Wk 33 • Day 230, 135 Left AUGUST 18, 1994

DIARY AND WORK RECORD

HRS	NAME OF PROJECT	DESCRIPTION	TIME
8 0800			
9 0900			
10 1000	.00 Williamson Ptg. Bill Davis		
11 1100	Jesse Williamson Bob Emrick.		
12 1200	AB II Within 4 weeks. Remove SB Lawsuit. HD/ES.		
1 1300	~~Arrange meeting Bill/Bob/Heid~~* ~~Heid - Bob Beyer~~*		
2 1400			
3 1500			
4 1600			
5 1700			

MONDAY

Wk 35 • Day 241, 124 Left AUGUST 29, 1994

DIARY AND WORK RECORD

HRS	NAME OR PROJECT	DESCRIPTION	TIME
8 0800	Alliante' Rodger Meir		
9 0900	(2) HV/ABII on everything (3) as all others plus UV.		
10 1000	Exhaust + BTU of IR.		
11 1100			
12 1200			
1 1300			
2 1400	.45 - Williamson Bill Davis.		
3 1500	102+L+Y+LX * triple tower		
4 1600			
5 1700			

MONDAY
SEPTEMBER 12, 1994

APPOINTMENTS & SCHEDULED EVENTS

HRS NAME PLACE SUBJECT

TO BE DONE TODAY (ACTION LIST)

6 color Biotech
Hi-Ace

EXPENSE & REIMBURSEMENT RECORD:

When? Where? Duration? Amount

WEDNESDAY
OCTOBER 5, 1994

31

DIARY AND WORK RECORD

8
0800

9
0900

10
1000

TO Williamson Pig.
Jesse W. / Bill Davis
Bob Emrick / Bill Gonzales.

11
1100

12
1200

1
1300

2
1400

3
1500

4
1600

5
1700

MONDAY
NOVEMBER 14, 1994
APPOINTMENTS & SCHEDULED EVENTS

HRS.	NAME	PLACE	SUBJECT

TO BE DONE TODAY (ACTION LIST)

Calls - Kleinfeld.
215-343-9300
1. Write to Brian Burton.
2. Select conference visit
Trade/Wilkerson.
3. JV extension.

EXPENSE & REIMBURSEMENT RECORD:

Item/What?	Where? Duration?	Paid?	By whom? Paid?	Reimbursed? By whom?	Amount

Bill Davis

TUESDAY ~~[illegible]~~ 438-9492

NOVEMBER 15, 1994

APPOINTMENTS & SCHEDULED EVENTS

HOURS	NAME	PLACE	SUBJECT

Patterson Press
Heid Spr / Sceler

2.8* - 3 S, 800 max
6 clamps each side
Emerstey [illegible] 22,000

TO BE DONE TODAY (ACTION LIST)

ANDERSON
KIRK
RICE.
Paisano

Pressure very critical
Course [illegible]
at 15000 [illegible] can
[illegible]

EXPENSE & REIMBURSEMENT RECORD:

Item What?	Where? Duration?	Purpose Who What Discussed?	To whom Paid?	Reimbursed? By whom?	Amount

Bill Davis 214-904-2100
Ed / Watson / Linda Mc

FRIDAY 30

Wk 46 • Day 322, 43 Left NOVEMBER 18, 1994

DIARY AND WORK RECORD

HRS	NAME OR PROJECT	DESCRIPTION	TIME
8	216 · 342 - 4740 Terry Stockrick.		
9	Kennedy printing ink Tim Scott / Bishop 513 - 87 - 2515		
10			
11	.00 Heidelberg USA.		
12			
1			
2			
3			
4			
5			
6	.00		

MONDAY
NOVEMBER 21, 1994
APPOINTMENTS & SCHEDULED EVENTS

HRS	NAME	PLACE	SUBJECT

TO BE DONE TODAY (ACTION LIST)

Performance 819,1000
Williamson P.C-904
3012 Fairmount

700 Package

EXPENSE & REIMBURSEMENT RECORD:

Item What?	Where? Duration?			Reimbursed? By whom?	Amount

MONDAY
Wk 47 • Day 325, 40 Left NOVEMBER 21, 1994 30
DIARY AND WORK RECORD

8 Jack Stoughton
Ray Heumann's.

9

10

11

2 cc Bill Davis

1 cc Bill Davis / Jesse Williamson
Terry Britton Training.

2

3 cc Tony Pate Performance
6CT63 2 Survivors
E

4

5

7:11 E.T.D. JACK STOUGHTON
FLT #1469 DELTA.

TUESDAY **31**

Wk 51 • Day 354, 11 Left — DECEMBER 20, 1994

DIARY AND WORK RECORD

HRS	NAME OR PROJECT / DESCRIPTION	TIME
8 (0800)	WILLIAMSON PTG.	
9 (0900)		
10 (1000)		
11 (1100)		
12 (1200)		
1 (1300)		
2 (1400)		
3 (1500)		
4 (1600)		
5 (1700)		

WEDNESDAY

Wk 51 • Day 355, 10 Left DECEMBER 21, 1994 **31**

DIARY AND WORK RECORD

HRS	NAME OF PROJECT	DESCRIPTION	HRS
8 0800	WILLIAMSON PTG.		
9 0900			
10 1000			
11 1100			
12 1200			
1 1300			
2 1400			
3 1500			
4 1600			
5 1700			

Wk 1 • Day 4. 361 Left

WEDNESDAY
JANUARY 4, 1995

DIARY AND WORK RECORD

HRS	NAME OR PROJECT	DESCRIPTION
8 0800		
9 0900		
10 1000		
11 1100		
12 1200		
1 1300	:30 AGI	Wayne Fox Mike Curtis.
2 1400	Metallic / Pearlescent. Hartmann Steinberg,	
3 1500	Toronto Dave Dafren	
4 1600	416-438-1622 Metallic.	
5 1700		

3

09315796.05050901

THURSDAY
Wk 2 • Day 12, 353 Left JANUARY 12, 1995 **31**

DIARY AND WORK RECORD

HRS | NAME OR PROJECT | DESCRIPTION | TIME

8 — Kansas City.

9 — Burd & Fletcher X 21st (Weekend)

10 — Midland Litho. Cancelled.

11

12

1

2 — St Louis Litho.

3 — 314-352-1300
Russ Runge
Joe Stein

4 — Very interested w/to match at least 90% of bronze

5

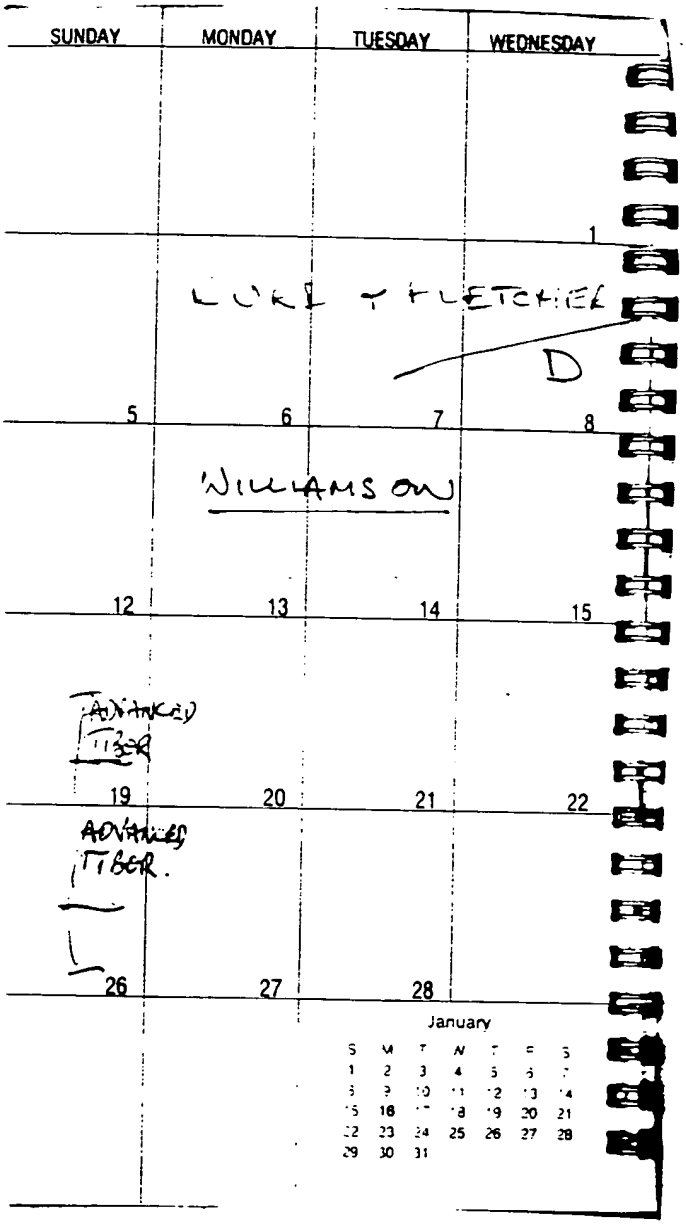
Chicago.
9:00 Cecil Frank 301-942-8572

MONDAY **31**

Wk 5 • Day 30. 335 Left — JANUARY 30, 1995

DIARY AND WORK RECORD

HRS	NAME OR PROJECT / DESCRIPTION	TIME
8 (0800)		
9 (0900)		
10 (1000)		
11 (1100)		
12 (1200)		
1 (1300)		
2 (1400)	:30 Williamson Ptg. G.	
3 (1500)		
4 (1600)		
5 (1700)		



Wk 6 • Day 40, 325 Left

THURSDAY
FEBRUARY 9, 1995

28

DIARY AND WORK RECORD

HRS	NAME OR PROJECT / DESCRIPTION
8 (0800)	Call Bill Davis / Williamson
	Bob Sweet quote 2 lamp
9 (0900)	and 4 over 4 'cold' UV
	26"/26"
10 (1000)	
11 (1100)	
12 (1200)	
1 (1300)	
2 (1400)	
3 (1500)	
4 (1600)	
5 (1700)	

SATURDAY
Wk 6 • Day 42, 323 Left FEBRUARY 11, 1995 28

DIARY AND WORK RECORD

HRS	NAME OR PROJECT	DESCRIPTION	TR
8 0800			
9 0900	:00 - HD/Williamson.		
10 1000			
11 1100			
12 1200			
1 1300			
2 1400			
3 1500			
4 1600			
5 1700			
	30miles		

T0050-96/SEP80

WEDNESDAY
FEBRUARY 15, 1995
Wk. 7 • Day 46. 319 Left
28

DIARY AND WORK RECORD

HRS.	NAME OR PROJECT / DESCRIPTION
8 (0800)	Vent-A-Hood order Touch pad - HV on LYC
9 (0900)	Schedule LYC MD Both samples
10 (1000)	Wolstenholme visiting April 1 onwards.
11 (1100)	:30 Bill Davis
12 (1200)	
1 (1300)	
2 (1400)	
3 (1500)	
4 (1600)	
5 (1700)	

T0980 0596 75136

FRIDAY
FEBRUARY 24, 1995
APPOINTMENTS & SCHEDULED EVENTS

HRS	NAME	PLACE	SUBJECT

Silver Wolstenholme
How much?
Gold

TO BE DONE TODAY (ACTION LIST)

EXPENSE & REIMBURSEMENT RECORD:

Item: What?	Where? Duration?	Purpose-Who What involved?	To whom Paid?	Reimbursed? By whom?	Amount

FRIDAY
Wk 8 • Day 55, 310 Left FEBRUARY 24, 1995 28

DIARY AND WORK RECORD

HRS | NAME OR PROJECT | DESCRIPTION | TIME

Williamson Rtg

Bob Emrick / Bill Davis
Jesse Williamson

Drying on impression after 45 min
Nothing showing on densitometer
~~Wet Trap / Dry Trap~~ / HV Trap.
Varnish definite advantage.
Mechanical shutter for edges.
7 color every unit.
HVon LYL only.

Wk 9 • Day 60, 305 Left

WEDNESDAY
MARCH 1, 1995

31

DIARY AND WORK RECORD

HRS | NAME OR PROJECT | DESCRIPTION | TIME

8
0800

9 Advanced Litho. Tullius Demetos
0900 Needs to look at EZ
10 metallic application
1000 a s a p.

11 He continues to want to
1100 work with EZ.

12 Brake got great future.
1200

1 Terry Meyers. - GAC.
1300 Need to come to Dallas

2
1400

3 Ron Sorg - Bofors.
Heidelberg Egypt.
1500
~~Metallics issue~~

4 Heid. 74 is of strong interest
1600 over next 12 months.

5
1700

TUESDAY
MARCH 7, 1995

APPOINTMENTS & SCHEDULED EVENTS

TIME	NAME	PLACE	SUBJECT
	Bill Davis		
	(1) Venta - food control on delivery?		
	(2) " complete Wednesday.		
	" " "		

TO BE DONE TODAY (ACTION LIST)

D I Charge.

EXPENSE & REIMBURSEMENT RECORD:

for what?	where? duration?	purpose and who involved?	to whom paid?	reimbursed? by whom?	amount

Wk 10 • Day 69, 296 Left

FRIDAY
MARCH 10, 1995

31

DIARY AND WORK RECORD

HRS	NAME OR PROJECT	DESCRIPTION
8 0800	Tim Johnson	
	Bill Davis	
9 0900	Bob Emrick.	
	Williamson P.C.	
10 1000	delay of get all sheets	
11 1100	H	
12 1200		
1 1300		
2 1400		
3 1500		
4 1600		
5 1700		

HRS.	NAME OR PROJECT	DESCRIPTION	TIME
8 0800	WILLIAMSON - MD. BOTH.		
9 0900	DICK MARSHAL. CHUCK GLASS		
10 1000			
11 1100			
12 1200			
1 1300			
2 1400			
3 1500			
4 1600			
5 1700			

DIARY AND WORK RECORD

THURSDAY
APRIL 6, 1995

APPOINTMENTS & SCHEDULED EVENTS

HRS.	NAME	PLACE	SUBJECT

TO BE DONE TODAY (ACTION LIST)

1 Marking - Coating tower
when ~~not~~ coating.
2. Exclusivity: 5 months
USA. - 12 months - Local?

EXPENSE & REIMBURSEMENT RECORD:

Item: What?	Where? Duration?	Purpose-Who What involved?	To whom Paid?	Reimbursed? By whom?	Amount

THURSDAY

Wk 14 • Day 96, 269 Left APRIL 6, 1995 **30**

DIARY AND WORK RECORD

HRS | NAME OR PROJECT | DESCRIPTION | TIME

8 0800

400 CFM = 1 ton.

9 0900

10 1000

11 1100

12 1200

What is coursel an Cox

1 1300

Jesse Williamson

2 1400

- Williamson Fy. Bill Davis

A Excellent? — Jim Johnson

3 1500

B. Samples - Lyl - within hrs.

C HV on #1 TRH! Nonhumming.

D ~~Visit - Von Hoffman~~ General Contractor

4 1600

E. Art Canvas - A Cox

5 1700

Jesse Williamson.

4:30 Jim Johnson

Ͳ0605005 ‧ 96/5T3E60

TUESDAY 30

Wk 17 • Day 115, 250 Left APRIL 25, 1995

DIARY AND WORK RECORD

HRS	NAME OR PROJECT	DESCRIPTION	T~F
8 0800			
9 0900			
10 1000	Williamson Ag Co.		
11 1100	Bill Davis / Tim Johnson	Rob Emmick.	
12 1200	Casket Leak -		
	24 hrs in a day counter		
1 1300	Tube to run Friday.		
	Testing Thursday.		
2 1400	Anchor reading White?	Gold?	
3 1500	Training		
4 1600	Water. 23.		
5 1700			

TUESDAY
MAY 2, 1995
APPOINTMENTS & SCHEDULED EVENTS

HRS	NAME	PLACE	SUBJECT

TO BE DONE TODAY (ACTION LIST)

1. ~~Lithoflex.~~ ✓
2. ~~Great Western~~ ✓
3. ~~Graphic Arts Monthly~~ /GATF
4. Gloss Back.
5. HV [illegible]
5. ~~Olsen order - gold - Bill~~
6. ~~Exclusivity :-~~
7. ~~Timeline~~ EZ's :-
8. Posters/Post Cards.

EXPENSE & REIMBURSEMENT RECORD:

Item - What?	Where? Duration?	Purpose-Who What Involved?	To whom Paid?	Reimbursed? By whom?	Amount

Pulled job, fit was problem.
excessive foam = pinholing

TUESDAY 30
Wk 18 • Day 122. 243 Left MAY 2, 1995
DIARY AND WORK RECORD

HRS.	NAME OR PROJECT	DESCRIPTION	TIME
8	Rebecca Caitlin		
9	Greetings.		
10	1st Period N. America + AZ, CO.		
11	1st Interstation 90 days to install 1 and 2 yyff.		
12			
1	.30 Jesse W. Pearson. Bill Davis		
2	See Andy take back. Leafing silver - Olson to WPC.		
3			
4	UV lamps moved down. PO# 331.5 1st down		
5	UV for 8 color	coater E2.	

(#25)

Exhibit "B"

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 741 025 A3

(12) EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
28.05.1997 Bulletin 1997/22

(43) Date of publication A2:
06.11.1996 Bulletin 1996/45

(21) Application number: 96303136.4

(22) Date of filing: 03.05.1996

(51) Int. Cl.[6]: B41F 31/30, B41F 5/24, B41F 23/08

(84) Designated Contracting States:
DE FR GB IT SE

(30) Priority: 04.05.1995 US 435798

(71) Applicant: DeMoore, Howard W.
Dallas, Texas 75220 (US)

(72) Inventors:
- DeMoore, Howard W.
Dallas, Texas 75220 (US)
- Randleman, Ronald M.
Dallas, Texas 75229 (US)
- Bird, John W.
Carrollton, Texas 75007 (US)

(74) Representative: Gura, Henry Alan et al
MEWBURN ELLIS
York House
23 Kingsway
London WC2B 6HP (GB)

(54) Retractable inking/coating apparatus having ferris movement between printing units

(57) A retractable in-line inking/coating apparatus (10) selectively applies either spot or overall ink/coating material to a blanket (B) or flexographic plate (P) on a blanket cylinder (34), or spot or overall ink/coating to a flexographic printing plate (P) on a plate cylinder (32) in a rotary offset printing press (12). The inking/coating apparatus is pivotally mounted on a printing unit (22, 24, 26, 28) or dedicated coating unit, and is extendable into and retractable out of an operative inking/coating position by a carriage assembly (58) which is pivotally coupled to the printing unit. Because of the pivotal support provided by a cantilevered support arm (88, 90), the inking/coating apparatus is extended and retracted through a Ferris wheel arc between adjacent printing units.

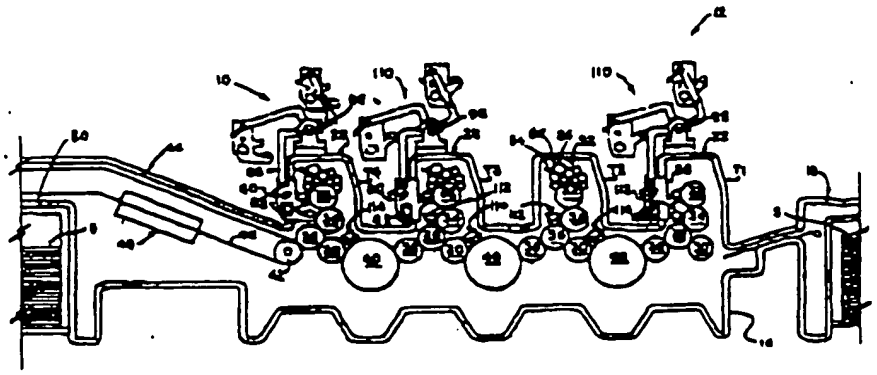


FIG. 1

EP 0 741 025 A3

Printed by Rank Xerox (UK) Business Services
2.14.3/3.4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 30 3136

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X Y	US 4 841 903 A (BIRD) * abstract; claims; figure 1 *	1,15-17 4-6,8,9, 13	B41F31/30 B41F5/24 B41F23/08
X	US 5 107 790 A (SLIKER ET AL.) * abstract; claim 1; figures * * column 2, line 9 - line 22 *	1,18	
Y	US 5 335 596 A (DEMOORE ET AL.) * abstract; figures 1-4 * * column 7, line 32 - line 58 *	4,5,8,9	
Y	US 4 617 865 A (SWITALL) * abstract; figures 1-3 * * column 6, line 9 - line 42 *	6	
Y	US 4 825 804 A (DIRICO ET AL.) * abstract; figures 2,3 * * column 3, line 10 - line 21 *	13	
A	EP 0 647 524 A (DEMOORE) * abstract; figures 1,2,5 * * column 4, line 32 - line 40 *	15-22	TECHNICAL FIELDS SEARCHED (Int.Cl.6) B41F
A	PAPIER + KUNSTSTOFF VERARBEITER, vol. 26, no. 6, 1 June 1991, page 129 XP000232825 "LACKIER-AGGREGAT FUER SPEEDMASTER-MASCHINEN"	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 March 1997	Helpiö, T

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 741 025 A2

(12) EUROPEAN PATENT APPLICATION

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(54) Retractable inking/coating apparatus having ferris movement between printing units

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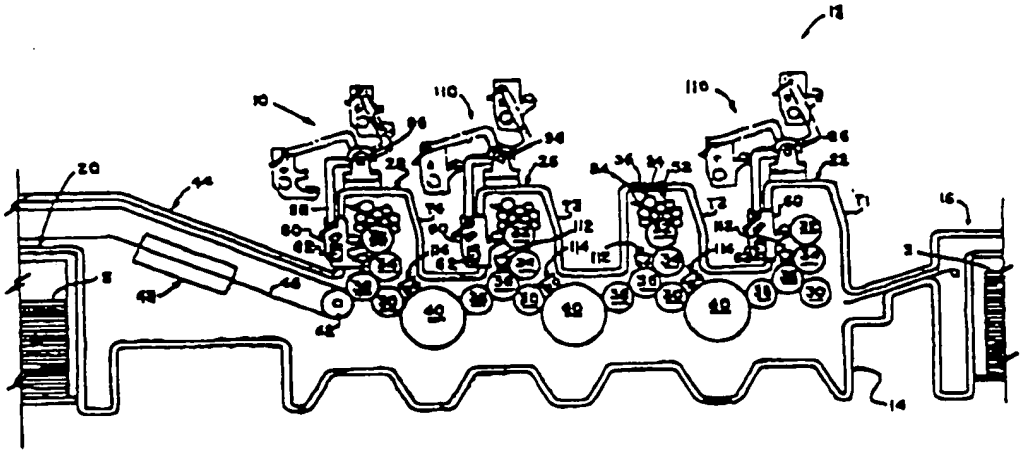


FIG. 1

EP 0 741 025 A2

Printed by Rank Xerox (UK) Business Services
2.13.8/3.4

Description

This invention relates to sheet-fed or web-fed, rotary offset or flexographic printing presses, and more particularly, to a new and improved inking/coating apparatus for the in-line application of printing inks or protective or decorative coatings to sheet or web substrates.

Conventional sheet-fed, rotary offset printing presses typically include one or more printing units through which individual sheets are fed and printed with wet ink. Since the inks used with rotary offset printing presses typically remain wet and tacky for some time after printing, special precautions must be taken to insure that the freshly printed sheets are not marked or smeared as the sheets are transferred from one printing unit to another, and while being conveyed to the sheet delivery stacker. The printed surface of the freshly printed sheet dries relatively slowly and can be smeared during subsequent transfer between printing units. In order to reduce smearing and offsetting, spray powder is applied on the printed sheet.

In some printing applications, offset and smearing are prevented by applying a protective and/or decorative coating over all or a portion of the freshly printed sheets. Various arrangements have been proposed for applying the protective or decorative coating as an in-line operation by using the last printing unit of the press as the coating application unit. However, when such in-line coating is performed, the last printing unit cannot be used to apply ink to the sheets, and can only be used for the coating operation. Thus, while coating with these types of in-line coating apparatus, the press loses the capability of printing its full range of colors since the last printing unit is converted to a coating unit.

It will be appreciated that the time required to reconfigure a press for coating or non-coating is non-productive and costly. Accordingly, there is a need for an in-line coating apparatus that minimizes the time to clean-up from one printing run and set-up and run the next job. Where consecutive jobs require the same type of coating, particularly blanket coating, it may not be necessary to clean-up the coater between jobs. However, the coating material cannot be allowed to dry on the rollers. Therefore, especially when switching from blanket to spot coating or vice versa, or if there is a delay between jobs, it is necessary to wash-up the coater after each job is completed.

In addition, coater wash-up is necessary when switching between different coating compositions, such as aqueous and ultra violet (UV) curable coatings. Such coating materials are not interchangeable, and consequently, the coater must be washed between applications of different coating media.

The foregoing limitations are overcome, according to the present invention, by a retractable, in-line inking/coating apparatus which is mounted on a printing unit for pivotal, Ferris wheel movement between an operative inking/coating position and a retracted, overhead idle position. The inking/coating apparatus includes an applicator head which, is positioned in alignment with either the plate cylinder or the blanket cylinder by a carriage assembly which includes a cantilevered support arm. The support arm is pivotally coupled between the inking/coating head and the printing unit tower. This cantilevered, pivotal mounting arrangement allows the inking/coating unit to be used between two printing units, as well as on the last printing unit of the press.

In the preferred embodiment, the applicator head includes vertically spaced pairs of cradle members with one cradle pair being adapted for supporting a metal or ceramic coating roller in alignment with a blanket cylinder, and the other cradle pair supporting a resilient anilox coating roller in alignment with the plate cylinder, respectively, when the carriage assembly is in the operative position. Because of the cantilevered, pivotal support provided by the support arm, the applicator head can be lifted and lowered through an arc, similar to Ferris wheel movement, in the limited space between adjacent printing units. When fully retracted, the applicator head and carriage assembly are lifted to an elevated, retracted overhead position, preferably an overhead position overlying the printing unit tower, thus providing complete access to the interstation space and the printing unit cylinders without causing the printing unit to lose its printing capability. The inking/coating applicator roller of the applicator head can be inspected, cleaned or replaced and the doctor blade assembly can be washed-up automatically while the inking/coating apparatus is in the retracted position.

When the inking/coating apparatus is used in combination with a flexographic printing plate and aqueous ink or aqueous coating, the water component of the aqueous ink or coating on the freshly printed sheet is evaporated by a high velocity, hot air interstation dryer and a high volume heat and moisture extractor assembly so that the freshly printed ink or coating is completely dry before the sheet is printed on the next printing unit. This quick drying flexographic printing/coating arrangement permits a base coat of ink, for example opaque white or metallic ink (gold, silver or other metallics) to be applied in the first printing unit, and then overprinted by a lithographic process on the next printing unit.

Exemplary embodiments of the present invention are illustrated in the drawing figures wherein:

FIGURE 1 is a schematic side elevational view of a sheet-fed, rotary offset printing press having inking/coating apparatus embodying the present invention;

FIGURE 2 is a perspective view of the printing press of FIGURE 1 in which a dual head inking/coating apparatus is in the operative coating position and a single head coater is in a retracted, overhead position;

FIGURE 3 is an enlarged simplified perspective view showing one side of the single head ink-

ing/coating apparatus of FIGURE 1 in the operative position;

FIGURE 4 is a simplified side elevational view showing the dual head inking/coating apparatus in the operative coating position for spot or overall coating from the blanket position;

FIGURE 5 is a simplified side elevational view showing the single head inking/coating apparatus in the operative coating position for spot or overall coating from the plate position; and,

FIGURE 6 is a simplified side elevational view of the dual head inking/coating apparatus of FIGURE 4, partially broken away, which illustrates the hydraulic drive assembly and doctor blade assembly.

As used herein, the term "processed" refers to various printing methods which may be applied to either side of a substrate, including the application of UV-curable and aqueous inks and/or coatings. The term "substrate" refers to sheet or web material. Also, as used herein, the term "waterless printing plate" refers to a printing plate having non-image surface areas which are hydrophobic and also having image surface areas which are hydrophilic, wherein the non-image surface areas are characterized by a surface tension value which is less than the surface tension of aqueous ink, and the image surface areas are characterized by a surface tension value which is greater than the surface tension of aqueous ink. "Flexographic" refers to flexible printing plates having a relief surface which is wettable by aqueous ink or aqueous coating material.

As shown in the exemplary drawings, the present invention is embodied in a new and improved in-line inking/coating apparatus 10, for applying inks or protective and/or decorative coatings to sheets or webs printed in a sheet-fed or web-fed, rotary offset or flexographic printing press, herein generally designated 12. In this instance, as shown in FIGURE 1, the inking/coating apparatus 10 is installed in a four color printing press 12, such as that manufactured by Heidelberger Druckmaschinen AG of the Federal Republic of Germany under its designation Heidelberg Speedmaster 102V. The press 12 includes a press frame 14 coupled at one end, herein the right end, to a sheet feeder 16 from which sheets, herein designated S, are individually and serially fed into the press, and at the opposite end, with a sheet delivery stacker 20 in which the freshly printed sheets are collected and stacked. Interposed between the sheet feeder 16 and the sheet delivery stacker 20 are four substantially identical rotary offset printing units 22, 24, 26 and 28 which can print different color inks onto the sheets as they are transferred through the press 12. The printing units are housed within printing towers T1, T2, T3 and T4 formed by side frame members 14, 15.

As illustrated, the printing units 22, 24, 26 and 28 are substantially identical and of conventional design. The first printing unit 22 includes an in-feed transfer cylinder 30, a plate cylinder 32, a blanket cylinder 34 and an impression cylinder 36, all supported for rotation in parallel alignment between the press side frames 14, 15. Each of the first three printing units 22, 24 and 26 have an interunit transfer cylinder 38 disposed to transfer the freshly printed sheets from the adjacent impression cylinder to the next printing unit via an interstation transfer cylinder 40. The last printing unit 28 is shown equipped with a delivery cylinder 42 which guides each freshly printed sheet 18 as it is transferred from the last impression cylinder 36 to a delivery conveyor system, generally designated 44, to the sheet delivery stacker 20.

The delivery conveyor system 44 as shown in FIGURE 2 is of conventional design and includes a pair of continuous delivery gripper chains 46, only one of which is shown carrying at regular spaced locations along the chains, laterally disposed gripper bars having gripper fingers for gripping the leading edge of a freshly printed sheet 18 after it leaves the nip between the delivery cylinder 42 and impression cylinder 36 of the last printing unit 28. As the leading edge is gripped by the grippers, the delivery chains 46 pull the freshly printed sheet away from the impression cylinder 36 and deliver the freshly printed sheet to the sheet delivery stacker 20.

Prior to reaching the delivery sheet stacker, the freshly printed and/or coated sheets S pass under a delivery dryer 48 which includes a combination of infrared thermal radiation, high velocity hot air flow and heat and moisture extraction for drying the ink and/or the protective/decorative coating on the freshly printed sheets.

In the exemplary embodiment shown in FIGURE 1, the first printing unit 22 is equipped with a flexographic printing plate, and does not require an inking roller train or a dampening system. If an ink roller train is mounted on the first printing unit, the form rollers are retracted and locked off when the printing unit goes on impression. Flexographic aqueous ink is supplied by the inking/coating unit 110. The remaining printing units 24, 26 and 28 are equipped for lithographic printing and include an inking apparatus 50 having an inking roller train 52 arranged to transfer ink from an ink fountain 54 to the plate cylinder 32. This is accomplished with the aid of a fountain roller 56 and a ductor roller. The fountain roller 56 projects into the ink fountain 54, whereupon its surface is wetted with printing ink Q. The printing ink Q is transferred intermittently to the inking roller train 52 by the ductor roller. The inking roller train 52 supplies printing ink Q to the image area of a printing plate P mounted on the plate cylinder 32.

The printing ink Q is transferred from the printing plate P to an ink receptive blanket B which is mounted on the blanket cylinder 34. The inked image carried on the blanket B is transferred to a sheet S as the sheet is transferred through the nip between the impression cylinder 36 and the blanket B.

The inking roller arrangement 52 illustrated in FIGURE 1 is exemplary for use in combination with lithographic ink printing plates. It will be understood that

dampening rollers (not illustrated) will be in direct engagement with the lithographic plate P, but are not used in combination with the flexographic plate of printing unit 22.

Referring now to FIGURE 4, FIGURE 5 and FIGURE 6, the in-line inking/coating apparatus 10 includes a carriage assembly 58 which supports an applicator head 60. The applicator head 60 includes a hydraulic motor 62, a lower gear train 64, an upper gear train 65, an applicator roller 66 and a doctor blade assembly 68. The external peripheral surface of the applicator roller 66 is inserted into wetting contact with liquid coating material or ink contained in a reservoir 70. The reservoir 70 is continuously supplied with ink or coating which is circulated through the reservoir 70 from an off-press source by a pump (not illustrated). The hydraulic motor 62 drives the applicator roller 66 synchronously with the plate cylinder 32 and the blanket cylinder 34 in response to an RPM control signal from the press drive (not illustrated) and a feedback signal developed by a tachometer 72. While a hydraulic drive motor is preferred, an electric drive motor can be used.

The applicator roller 66 is preferably a fluid metering anilox roller which transfers measured amounts of printing ink or coating material onto the printing plate or blanket. The surface of an anilox roller is engraved with an array of closely spaced, shallow depressions referred as "cells". Ink or coating material from the reservoir 70 flows into the cells as the anilox roller turns through the reservoir. The transfer surface of the anilox roller is scraped with a doctor blade 73 to remove excess ink or coating. The ink or coating remaining on the anilox roller is the measured amounts contained within the cells.

The applicator roller 68 is cylindrical and may be constructed in various diameters and lengths, containing cells of various sizes and shapes. The volumetric capacity of an anilox roller is established during manufacturing and is dependent upon the selection of cell size, shape and number of cells per unit area. Depending upon the intended application, the cell pattern may be fine (many small cells per unit area) or coarse (fewer larger cells per unit area).

By applying the ink or coating material through the inking/coating applicator head 60, more ink or coating material can be delivered to the sheet S as compared with the inking roller train of a lithographic printing unit. Moreover, color intensity is stronger and more brilliant because the flexographic ink is applied at a much larger film thickness than can be applied by the lithographic process and is not diluted by dampening solution.

The inking/coating applicator head 60 includes side frame members 74, 76 that support the applicator roller 66, gear train 64, gear train 65, doctor blade assembly 68 and the drive motor 62. The applicator roller 66 is supported at opposite ends on a lower cradle formed by a pair of end plates 78, 80 which hold the applicator roller 66 in parallel alignment with the blanket cylinder 34 (FIGURE 5). The side frames 74, 76 are also provided with an upper cradle formed by a pair of side plates 82, 84 which are vertically spaced with respect to the lower side plates 78, 80. Each cradle has a pair of sockets 79, 81 and 83, 85, respectively, for holding the applicator roller 66 for spot coating or inking engagement against the plate P of the plate cylinder 32 (FIGURE 4) or the blanket B of the blanket cylinder 34.

Preferably, the applicator roller 66 for the upper cradle (plate) position is an anilox roller having a resilient transfer surface. In the dual cradle arrangement, the press operator can quickly change over from blanket inking/coating and plate inking/coating with minimum press down time, since it is only necessary to remove and reposition or replace the applicator roller 66, and wash-up the doctor blade assembly if changing from ink to coating or vice versa. The capability to selectively operate in either the flexographic mode or the lithographic mode and to print or coat from either the plate or blanket position is referred to herein as the "LITHOFLEX" process.

Referring again to FIGURE 2 and FIGURE 3, the applicator head 60 is supported by the carriage assembly 58 in a cantilevered, pivotal arrangement which allows the dual cradle inking/coating apparatus 10 and a single cradle inking/coating apparatus 110 to be used between any two adjacent printing units, as well as used on the first and last printing units of the press. This is made possible by a pair of cantilevered support arms 88, 90 that are pivotally coupled to the side plates 74, 76, respectively, on a pivot shaft 77. Each support arm has a hub portion 88A, 90A, respectively, and an elongated shank portion 88B, 90B, respectively.

The cantilevered support arms are pivotally mounted on the printing tower by pivot blocks 92, 94, respectively. The hub portions 88A, 90A are journalled for rotation on pivot shafts 96, 98, respectively. The pivot blocks 92, 94 are securely fastened to the tower 14D, so that the carriage assembly 58 is pivotally suspended from the pivot shafts 96, 98 in a cantilevered Ferris support arrangement. The shank portions 88B, 90B are pivotally coupled to the pivot shaft 77, so that the carriage assembly 58 and the applicator head 60 are capable of independent rotation with respect to each other and with respect to the pivot shaft 77. By this arrangement, the applicator head 60 is pivotally suspended from the pivot shaft 77, and remains in an upright orientation as the support arms rotate from the operative position to the fully retracted position, and vice versa.

Thus, the cradles 78, 80 and 82, 84 position the applicator roller 66 in vertical and horizontal alignment with the plate cylinder or blanket cylinder when the applicator head is extended to the operative position, for example as shown in FIGURE 4 and FIGURE 5. Moreover, because of the transverse relationship between the hub portion and shank portion of the support arms, the applicator head 60 and carriage assembly 58 are capable of rotating through a Ferris arc without touching the adjacent printing tower. This makes it possible to install the inking/coating apparatus 10 on any intermedi-

ate printing unit tower (T2, T3), and as well as on the first printing unit tower T1 and the last printing unit tower T4. Additionally, when the inking/coating unit 10 is in the operative position, the lateral projection of the applicator head 60 into the interstation space between printing units is minimized. This assures virtually unrestricted operator access to the interstation space between adjacent printing units when the applicator head is engaged in the operative position, and completely unrestricted access when the carriage assembly 58 is retracted.

Rotation of the carriage assembly 58 is counterclockwise from the retracted, idle position (shown in phantom in FIGURE 1) to the operative position (FIGURE 4 and FIGURE 5). The carriage assembly 58 can be adapted for clockwise rotation from the retracted position to the operative position for engagement of the applicator roller to either the plate or the blanket on the dampener side of the tower, assuming that access to the plate and blanket is not restricted by dampener rollers or the like.

Rotational movement of the support arms 88, 90 is assisted by counterweights 100, 102 which are secured to the support arms, respectively, for concurrent rotation with respect to the pivot blocks 92, 94. With the passive assistance of the counterweights, the press operator can easily move the inking/coating assembly 10 from the engaged operative position as shown in FIGURE 4 to the fully retracted, idle position as shown in phantom in FIGURE 1. Preferably, rotation of the carriage assembly 58 is assisted by a torsion spring, electric motor or hydraulic motor.

The inking/coating apparatus 10 is releasably locked into the operative position as shown in FIGURE 4 by releasable latch couplings 103, 105 that secure the support arms 88, 90 to the press side frames 14, 15, respectively, of the printing unit tower T4 in the operative position. Coating engagement of the applicator roller 66 against the blanket cylinder 34 is produced by power actuators, preferably pneumatic cylinders 104, 106 which have extendable/retractable power transfer arms 104A, 106A, respectively. The pneumatic cylinder 104 is pivotally coupled to the support arm 88 by a pivot linkage 108, and the second pneumatic cylinder 106 is pivotally coupled to the support arm 90 by a pivot linkage 109. In response to actuation of the pneumatic cylinders 104, 106, the power transfer arms are retracted. As the transfer arms retract, the inking/coating head 60 is rotated counterclockwise on the pivot shaft 77, thus moving the applicator roller 66 into coating engagement with the blanket cylinder 34.

The pivot linkage 108 includes a bell crank 111 which is mounted for pivotal movement on a pin 113. The pin 113 is supported by a clevis plate 115 which is attached to the support arm 88. One end of the bell crank is pivotally coupled to the actuator arm 104A, and a cam roller 117 is mounted for rotation on its opposite end.

The cam roller 117 is engagable against an adjustable stop 119 which is rigidly secured to the side plate 74. Counterclockwise shifting of the handle H moves a cam follower 121 into a latch pocket 123 of a receiver block 125 as the cam roller 117 is moved into engagement with the adjustable stop 119 in the interlocked, operative position. Referring to FIGURE 4, FIGURE 5 and FIGURE 6, the receiver block 125 is secured to the delivery side of the printing unit tower by machine screws.

When the plate P goes on impression, power is applied to the pneumatic actuator 104 and the power transfer arm 104A retracts, thus causing the bell crank 111 to rotate counterclockwise about the pin 113. The torque applied by the pneumatic actuator 104 is transmitted to the applicator head 60 through the cam roller 117 and the adjustable stop 119. Counterclockwise movement of the applicator head 60 relative to the support shaft 77 carries the applicator roller 66 into engagement with the plate P.

The adjustable stop 119 has a threaded bolt 119A which is engagable with the cam roller 117. The striking point of engagement is preset so that the applicator roller 66 is properly positioned for engagement with the plate P or blanket B in the operative position when the applicator head 60 is interlocked with the press frame 14 and the printing unit goes on impression.

Referring to FIGURE 5, an inking/coating apparatus 110 having a single head is illustrated. The construction of this alternative embodiment is identical in all respects with the dual head arrangement, with the exception that only a single gear train and a single cradle for holding the applicator roller is provided. In both embodiments, the inking/coating head 60 remains upright as it swings through an arc, comparable to the movement of a Ferris wheel. Because of the upright orientation of the inking/coating head 60 as it moves between the extended and retracted positions, the usual platform spacing between printing unit towers provides adequate clearance to permit extension and retraction of the carriage assembly 58 without interference with operator access to the printing units. This is a significant advantage in that it permits the in-line inking/coating apparatus 10 to operate effectively in the interstation space between any adjacent printing units, and without blocking or obstructing access to the cylinders of the printing units when the inking/coating apparatus is in the retracted position (as indicated in phantom in FIGURE 1).

Moreover, when the in-line inking/coating apparatus is in the fully retracted position, the applicator roller 66 is conveniently positioned on the dampener side of the printing unit for inspection, clean-up or replacement. Additionally, the doctor blade assembly is also conveniently positioned for inspection, removal, adjustment or clean-up. Also, the doctor blade reservoir and coating circulation lines can be cleaned while the press is running as well as when the press has been stopped for change-over from one type of ink or coating material to another.

When the inking/coating apparatus is used for applying an aqueous ink or an aqueous coating material, the water component on the freshly printed sheet S is evaporated by a high velocity, hot air interstation dryer and high volume heat and moisture extractor units 112 and 114, as shown in FIGURE 1, FIGURE 4 and FIGURE 5. The dryer/extractor units 112 and 114 are oriented to direct high velocity heated air onto the freshly printed/coated sheets as they are transferred by the interunit and the intermediate transfer cylinders 36, 40. By this arrangement, the freshly printed aqueous ink or coating material is completely dry before the sheet is overprinted in the next printing unit.

The high velocity, hot air dryer and high performance heat and moisture extractor units 112, 114 utilize high velocity air jets which scrub and break-up the moist air level which clings to the surface of each freshly printed sheet. Within each dryer, high velocity air is heated to a high temperature as it flows across a resistance heating element within an air delivery baffle tube. High velocity jets of hot air are discharged through multiple airflow apertures through an exposure zone Z (FIGURE 4 and FIGURE 5) onto the freshly printed/coated sheet S as it is transferred by the transfer cylinder 36 and intermediate transfer cylinder 40, respectively. Each dryer assembly includes a pair of air delivery dryer heads which are arranged in spaced, side-by-side relation as shown in FIGURE 4 and FIGURE 5.

The high velocity, hot moisture-laden air displaced from each freshly printed sheet is extracted from the dryer exposure zone Z and completely exhausted from the printing unit by the high volume extractors. Each extractor head includes a manifold coupled to the dryer heads and draws the moisture, volatiles and high velocity hot air through a longitudinal gap between the dryer heads. According to this arrangement, each printed sheet is dried before it is run through the next printing unit.

The water-based inks used in flexographic printing dry at a relatively moderate drying temperature provided by the interstation high velocity hot air dryers/extractors 112, 114. Consequently, print quality is substantially improved since the aqueous ink is dried at each printing unit before it enters the next printing unit. Moreover, back-trapping on the blanket of the next printing unit is completely eliminated. This interstation drying arrangement makes it possible to print aqueous inks such as metallic ink and opaque white ink at one printing unit, and then overprint at the next printing unit.

This arrangement also permits the first printing unit to be used as a coater in which an aqueous coating is applied to low grade paper, for example recycled paper, to trap and seal in lint, dust, spray powder and other debris and provide a smoother, durable surface that can be overprinted in the next printing unit. The first down coating seals the surface of the low grade, rough substrate and improves overprinted dot definition while preventing strike-through and show-through. A UV-curable protective and/or decorative coating can be applied over the first down overprinted (aqueous) coating in the last printing unit.

Preferably, the applicator roller 66 is constructed of metal or ceramic when it is used for applying a coating material to the blanket B on the cylinder 34. When the applicator roller 66 is applied to the plate, it is preferably constructed as an anilox roller having a resilient transfer surface for engaging a flexographic printing plate. Suitable resilient roller surface materials include Buna N synthetic rubber and EPDM (terpolymer elastomer).

It will be appreciated that the inking/coating apparatus 10 is capable of applying a wide range of ink types, including fluorescent (Day Glo), pearlescent, metallics (gold, silver and other metallics), glitter, scratch and sniff (micro-encapsulated fragrance), scratch and reveal, luminous, pressure-sensitive adhesives and the like.

The press operator can eliminate the dampener roller assembly altogether, and the inking/coating apparatus 10 can selectively apply aqueous inks and coatings to a flexographic or waterless printing plate and the blanket. Moreover, overprinting of the aqueous inks and coatings can be carried out in the next printing unit since the aqueous inks and coatings are completely dried by the high velocity, hot air interstation dryer and high volume heat and moisture extractor assembly.

The aqueous inks and coatings as used in the present invention contain colored pigments and/or soluble dyes, binders that fix the pigments onto the surface of the printed sheet, and waxes, defoamers and thickeners. Aqueous printing inks predominantly contain water as a solvent, diluent and/or vehicle. The thickeners which are preferred include algonates, starch, cellulose and its derivatives, for example cellulose esters or cellulose ethers and the like. Coloring agents including organic as well as inorganic pigments may be derived from dyes which are insoluble in water. Also, the printing ink may contain water and can be predominantly glycol or the like, with the pigment being bound by an appropriate resin. When metallic inks are printed, the cells of the anilox roller must be appropriately sized to prevent the metal particles from getting stuck within the cells. The cell size is critical, and for metallic gold ink, the anilox roller should have a screen line count in the range of 175-300 lines per inch (69-118 lines per cm).

The inking/coating apparatus 10 can also apply UV-curable inks and coatings. If UV-curable inks and coatings are utilized, ultra-violet dryers/extractors are installed adjacent the high velocity hot air dryer/extractor units 112, 114, respectively.

It will be appreciated that the inking/coating apparatus 10 described herein makes it possible to selectively operate a printing unit in either the flexographic printing mode or the lithographic printing mode, while also providing the capability to print or coat from either the plate or blanket position. The dual cradle support arrangement of the present invention makes it possible to quickly change over from inking/coating at the blanket

cylinder position to inking/coating at the plate cylinder position with minimum press down-time, since it is only necessary to remove and reposition or replace the applicator roller 66 while the printing/inking apparatus is in the retracted position.

Moreover, the press operator may elect to spot or overall coat with aqueous ink/coating from the plate during one job, and then spot and/or overall coat from the blanket during the next job. Since the doctor blade assembly can be flushed and washed-up quickly and the applicator roller can be replaced quickly, it is possible to spot coat or overall coat from the plate position or the blanket position with aqueous inks or coatings during the first press run and then spot coat or overall coat with UV-curable inks or coatings from the plate position or from the blanket position during the next press run. The inking/coating apparatus 10 is completely out of the way in the retracted position; consequently, the doctor blade reservoir and supply lines can be flushed and washed-up by automatic wash-up equipment while the printing unit is printing another job.

The positioning of the applicator head and roller assembly relative to the plate and blanket is repeatable to a predetermined, preset impression position. Consequently, no printing unit adjustment or alteration is required, except for flushing the doctor blade assembly and cleaning or replacing the applicator roller to accommodate a different kind of ink or coating material. Although manual extension and retraction have been described in connection with the exemplary embodiment, extension to the operative position and retraction to a non-operative idle position can be carried out automatically by hydraulic or electric motor servomechanisms.

The Ferris wheel support arrangement allows the inking/coating apparatus to operate effectively in the interstation space between any adjacent printing units, as well as on the first or last printing units of the press, without blocking or obstructing the interstation space or restricting operator access to the cylinders of any of the printing units.

Finally, because the inking/coating apparatus of the present invention is mounted on a printing unit tower and is extendable to the operative position without requiring adjustment or alteration of the printing unit cylinders, it can be used for applying printing ink or coating material to the blanket cylinder of a rotary offset web press, or to the blanket of a dedicated coating unit.

Claims

1. Inking/coating apparatus (10) for use in a printing press (12) of the type having a printing unit (22, 24, 26, 28) on which a plate cylinder (32), a blanket cylinder (34) and an impression cylinder (36) are mounted for rotation, wherein the inking/coating apparatus is characterized by:

   an applicator head (60) for applying ink or coating material to a plate (P) mounted on the plate cylinder or to a blanket (B) mounted on the blanket cylinder, either separately or simultaneously when the inking/coating apparatus is in an operative position relative to the plate and blanket cylinders; and,

   a carriage assembly (58) for moving the applicator head to the operative position in which the applicator head is disposed laterally adjacent to the plate and blanket cylinders and for moving the applicator head from the operative position to a retracted position in which the applicator head is elevated with respect to the plate and blanket cylinders.

2. Inking/coating apparatus (10) as set forth in claim 1, wherein the carriage assembly (58) is characterized by:

   a support arm (88, 90) having a first end portion (88A) constructed for pivotal attachment to the printing unit and having a second end portion (88B) pivotally coupled to the applicator head (60), the applicator head being movable on the support arm to the operative position.

3. Inking/coating apparatus (10) as set forth in claim 1, characterized in that a counterweight (100, 102) is coupled to the carriage assembly.

4. Inking/coating apparatus (10) as set forth in claim 1, wherein the applicator head (60) is characterized by:

   a doctor blade assembly (68) having a reservoir (70) for receiving ink or liquid coating material; and,

   an applicator roller (66) coupled to the doctor blade assembly in fluid communication with the reservoir, the applicator roller being engagable with a printing plate (P) on the plate cylinder or with a blanket (B) on the blanket cylinder when the applicator head (60) is in the operative position.

5. Inking/coating apparatus (10) as set forth in claim 4, characterized in that the applicator roller (66) is an anilox roller having a resilient transfer surface.

6. Inking/coating apparatus (10) as set forth in claim 1, characterized in that:

   a power actuator (104, 106) is movably coupled to the applicator head (60), the power actuator having a power transfer arm (104A, 106A) which is extendable and retractable; and,

   movement converting apparatus (108) is coupled to the power transfer arm for converting

extension or retraction movement of the power transfer arm into pivotal movement of the applicator head (60) relative to the carriage assembly.

7. Inking/coating apparatus (10) as set forth in claim 6, wherein the movement converting apparatus (108) is characterized by:

a bell crank plate (111) having a first end portion coupled to the power transfer arm and having a second end portion for engaging a stop member;
a stop member (119) secured to the applicator head (60); and,
a clevis plate (115) secured to the carriage assembly (58) and pivotally coupled to the bell crank plate.

8. Inking/coating apparatus (10) as set forth in claim 1, wherein the applicator head (60) is characterized by:

first and second side frame members (74, 76) pivotally coupled to the carriage assembly (58);
a doctor blade assembly mounted on the first and second side frame members, the doctor blade assembly including a reservoir (70) for receiving ink or liquid coating material;
a cradle assembly (78, 80), (82, 84) mounted on the first and second side frame members, respectively;
an applicator roller (66) mounted for rotation on the cradle assembly and coupled to the doctor blade assembly for rolling contact with ink or coating material in the reservoir, the applicator roller being engagable with a printing plate (P) on the plate cylinder (32) or with a blanket (B) on the blanket cylinder (34) when the applicator head (60) is in the operative position; and,
a drive motor (62) coupled to the applicator roller for rotating the applicator roller.

9. Inking/coating apparatus (10) as set forth in claim 8, characterized in that:

the cradle assembly (79, 80) has first and second sockets (79, 81) disposed on the first and second side frame members respectively; and,
the applicator roller (66) is mounted for rotation on the first and second sockets.

10. Inking/coating apparatus (10) as set forth in claim 8, characterized in that

the cradle assembly (78, 80), (82, 84) includes first and second sockets (79, 81) disposed on the first and second side frame members, respectively, and third and fourth sockets disposed on the first and second side frame members, respectively; and,
the applicator roller (66) is selectively mountable for rotation on either the first and second sockets or on the third and fourth sockets for applying ink or coating material to either the plate or blanket when the applicator head is in the operative position.

11. Inking/coating apparatus (10) as set forth in claim 1, wherein the applicator head (60) is characterized by:

a first cradle (78, 80) for supporting an applicator roller (66) for engagement with the plate when the inking/coating apparatus is in the operative position; and
a second cradle (82, 84) for supporting an applicator roller (66) for engagement with the blanket (B) when the inking/coating apparatus is in the operative position.

12. Inking/coating apparatus (10) as set forth in claim 1, wherein the carriage assembly is characterized by:

a support arm (88, 90) having a first end portion pivotally coupled to the printing unit (88A, 90A) and having a second end portion (88B, 90B);
a common pivot shaft (77) on which the support arm second end portion and the inking/coating apparatus are pivotally mounted; and,
male and female latch members (103, 105) coupled between the common pivot shaft and the printing unit, with one of the latch members being secured to the common pivot shaft and the other latch member being constructed for attachment onto the printing unit, the latch members being mateable in interlocking engagement when the applicator head (60) is in the operative position.

13. Inking/coating apparatus (10) as set forth in claim 1, wherein the applicator head (60) and the printing unit are characterized by:

male and female latch coupling members (103, 105) mounted on the carriage assembly (58) and on the printing unit for releasably latching the carriage assembly in interlocking engagement with the printing unit when the applicator head is in the operative position.

14. Inking/coating apparatus (10) as set forth in claim 1, wherein the carriage assembly (58) is characterized by an elongated shank portion (88B, 90B) and a hub portion (88A, 90A), the elongated shank portion being pivotally coupled to the applicator head

(60) and the hub portion being constructed for pivotal attachment onto the printing unit.

15. A rotary offset printing press (12) having first and second printing units (22, 24) and the inking/coating apparatus (10) of claim 1 is movably coupled to the first printing unit (22) as set forth in claim 1, characterized by:

a dryer (112) mounted on the first printing unit adjacent the impression cylinder (36) of the first printing unit for discharging heated air onto a freshly printed substrate while the freshly printed substrate is in contact with said impression cylinder.

16. A rotary offset printing press (12) as defined in claim 15, characterized in that:

an extractor (112E) is disposed adjacent the dryer for extracting hot air, moisture and volatiles from an exposure zone (Z) between the dryer and the freshly printed substrate.

17. A rotary offset printing press (12) as defined in claim 15, characterized in that:

an intermediate transfer cylinder (40) is coupled in sheet transfer relation with the impression cylinder (36) of the first printing unit (22); and,
an interstation dryer (114) is disposed adjacent the intermediate transfer cylinder for discharging heated air onto a freshly printed or coated substrate after it has been transferred from the impression cylinder of the first printing unit and while it is in contact with the intermediate transfer cylinder (40).

18. A method for rotary offset printing in a printing press (12) of the type including first and second rotary offset printing units (22, 24), and using aqueous or UV-curable printing ink or coating material in the operation of at least the first printing unit, characterized by the following steps performed at each printing unit in succession:

spot or overall coating a plate (P) with aqueous ink/aqueous coating material or UV-curable ink/UV-curable coating material;
spot and/or overall coating a blanket (B) with aqueous ink/aqueous coating material or UV-curable ink or UV-curable coating material;
transferring the printing ink or coating material from the printing plate (P) to the blanket (B);
transferring the inked or coated image from the blanket to a substrate (S) as the substrate is transferred through the nip between the impression cylinder (36) and the blanket (B); and,
drying the ink or coating material on the freshly printed substrate before the substrate is subsequently processed.

19. A method for rotary offset printing as defined in claim 18, wherein the drying step is characterized by:

discharging high velocity, heated air onto the freshly printed/coated substrate (S) while the freshly printed/coated substrate is in contact with the impression cylinder (36) of the first printing unit (22).

20. A method for rotary offset printing as defined in claim 18, characterized by the steps:

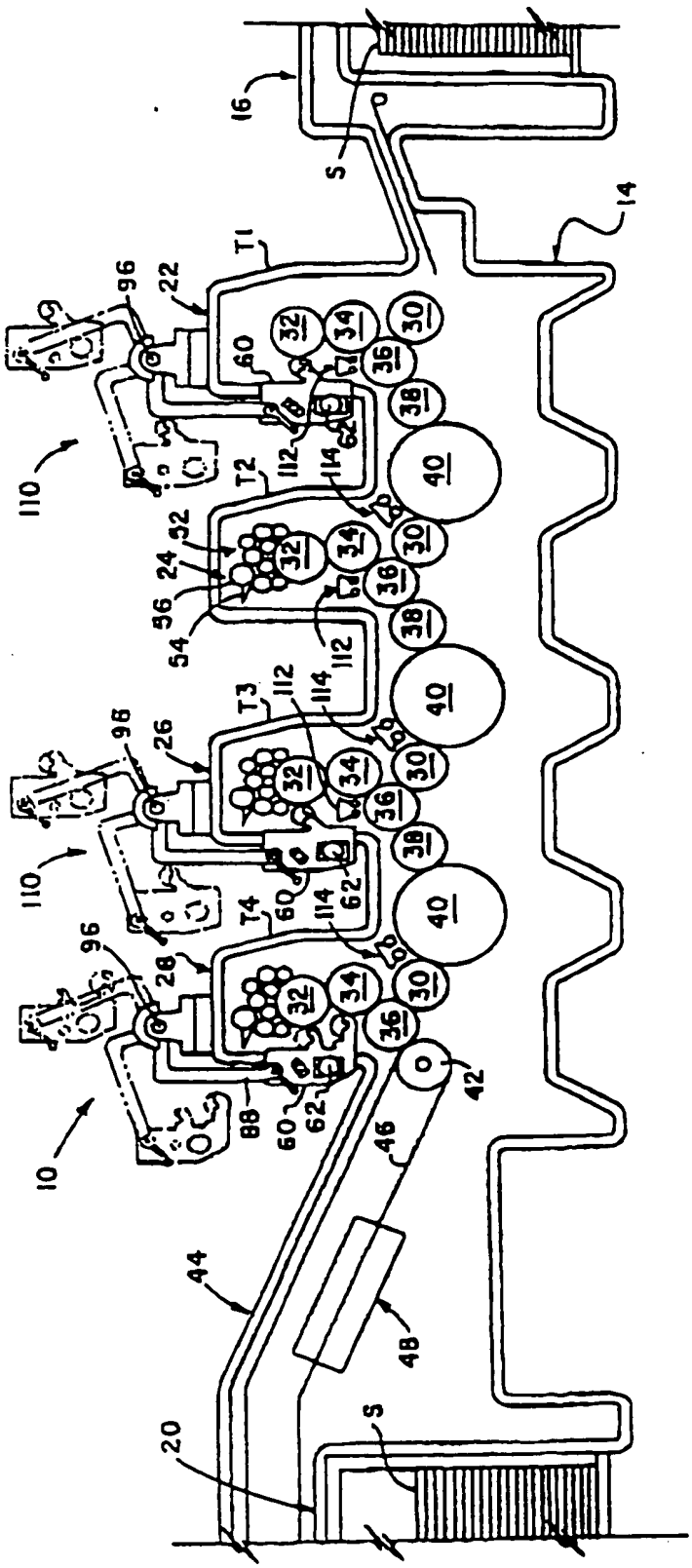
transferring the freshly printed substrate (S) from the first printing unit (22) to an intermediate transfer cylinder (40); and,
drying the freshly printed substrate while it is in contact with the intermediate transfer cylinder.

21. A method for rotary offset printing as defined in claim 18, characterized by the step:

extracting hot air, moisture and volatiles from an exposure zone (Z) above the freshly printed/coated substrate (S) while the freshly printed/coated substrate is in contact with the impression cylinder (36).

22. A method for rotary offset printing as defined in claim 18, characterized by the steps:

applying a primer coating of an aqueous coating material or UV-curable coating material to a substrate (S) in the first printing unit (22); and,
drying the primer coating on the substrate before the substrate is processed in the second printing unit.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16
S
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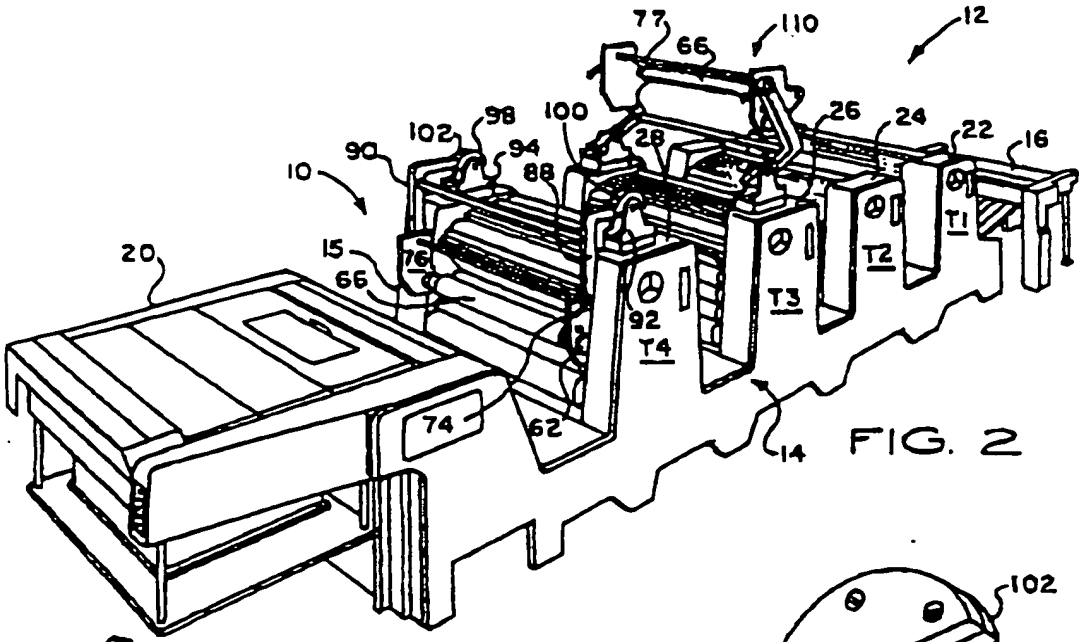
T1
22
96
60
32
34
30
36
38
40
110
112
114
62
T2
52
24
56
54
T3
26
98
T4
28
88
42
46
44
48
20
10

FIG. 1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16
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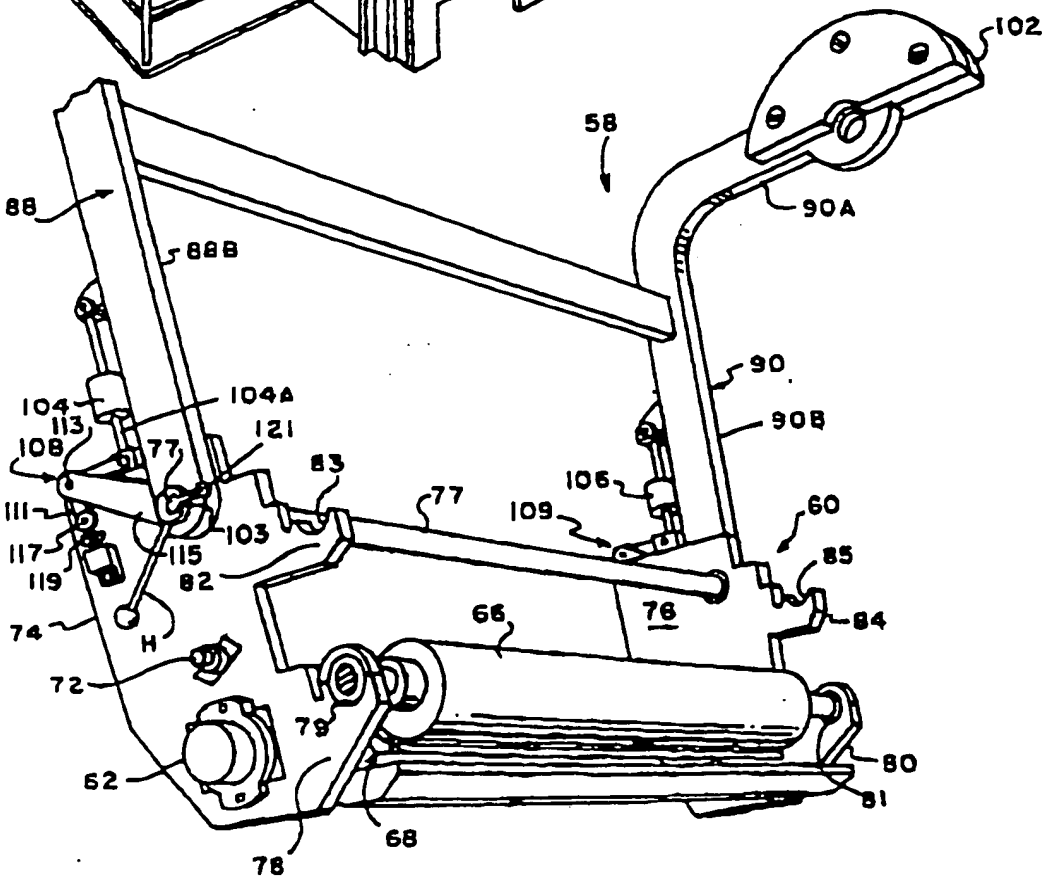
66
T1
T2
T3
92
T4
74
62
14

FIG. 2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888
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113
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111
103
109
60
117
115
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82
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74
H
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80
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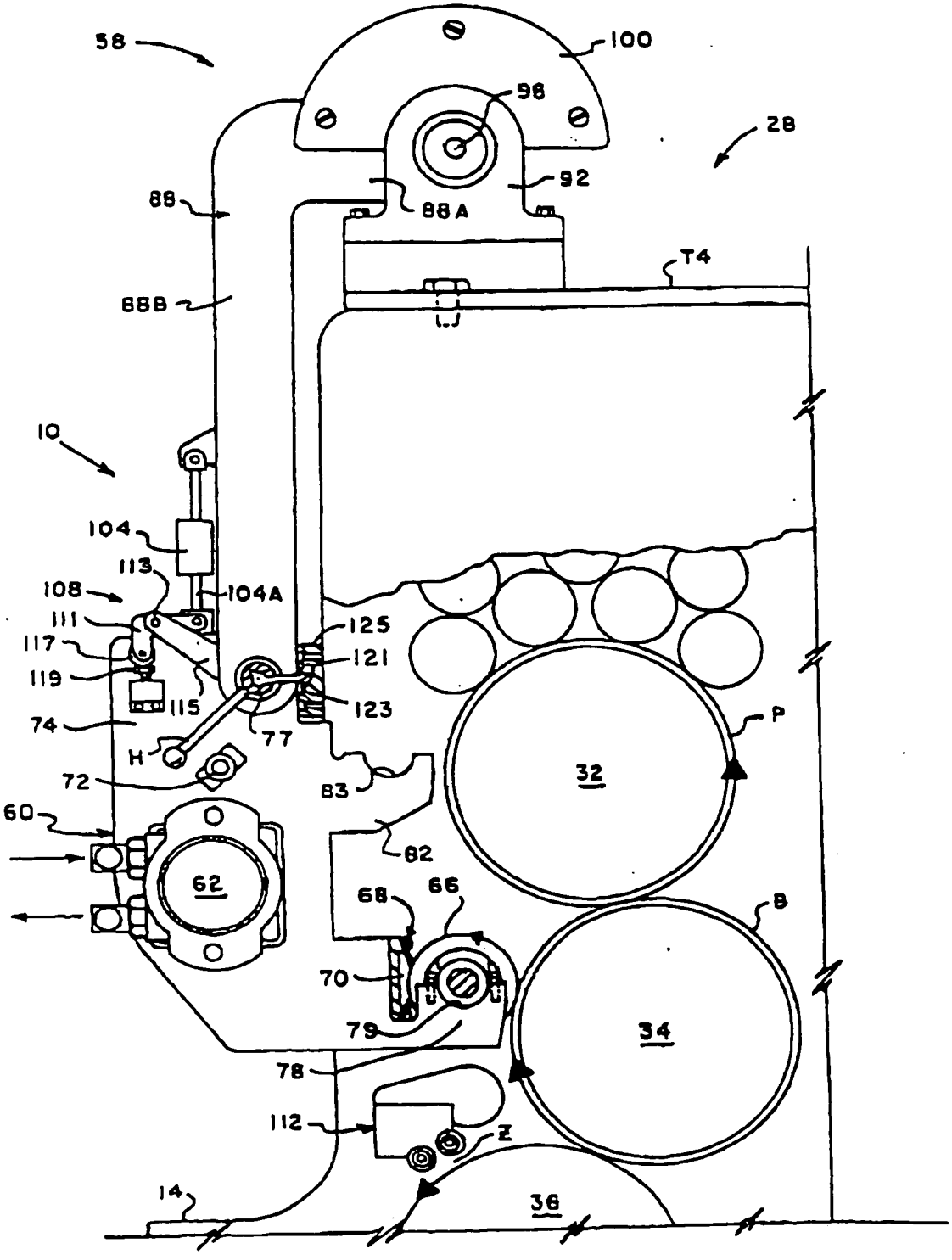
81
68
78

FIG. 3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113
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125
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115
123
74
77
H
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60
82
62
68
66
B
70
34
79
78
112
Z
14
36

FIG. 4

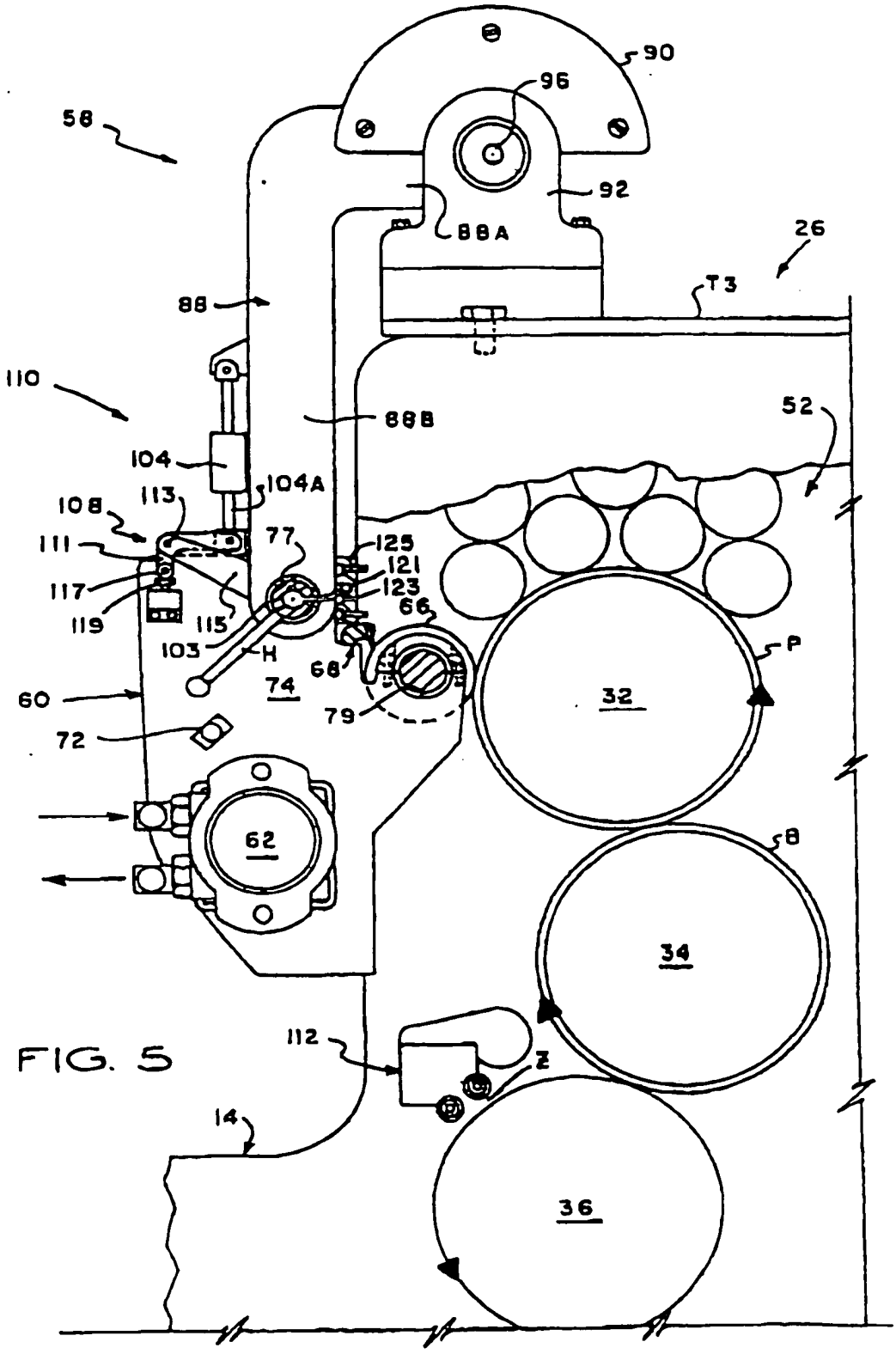

FIG. 5

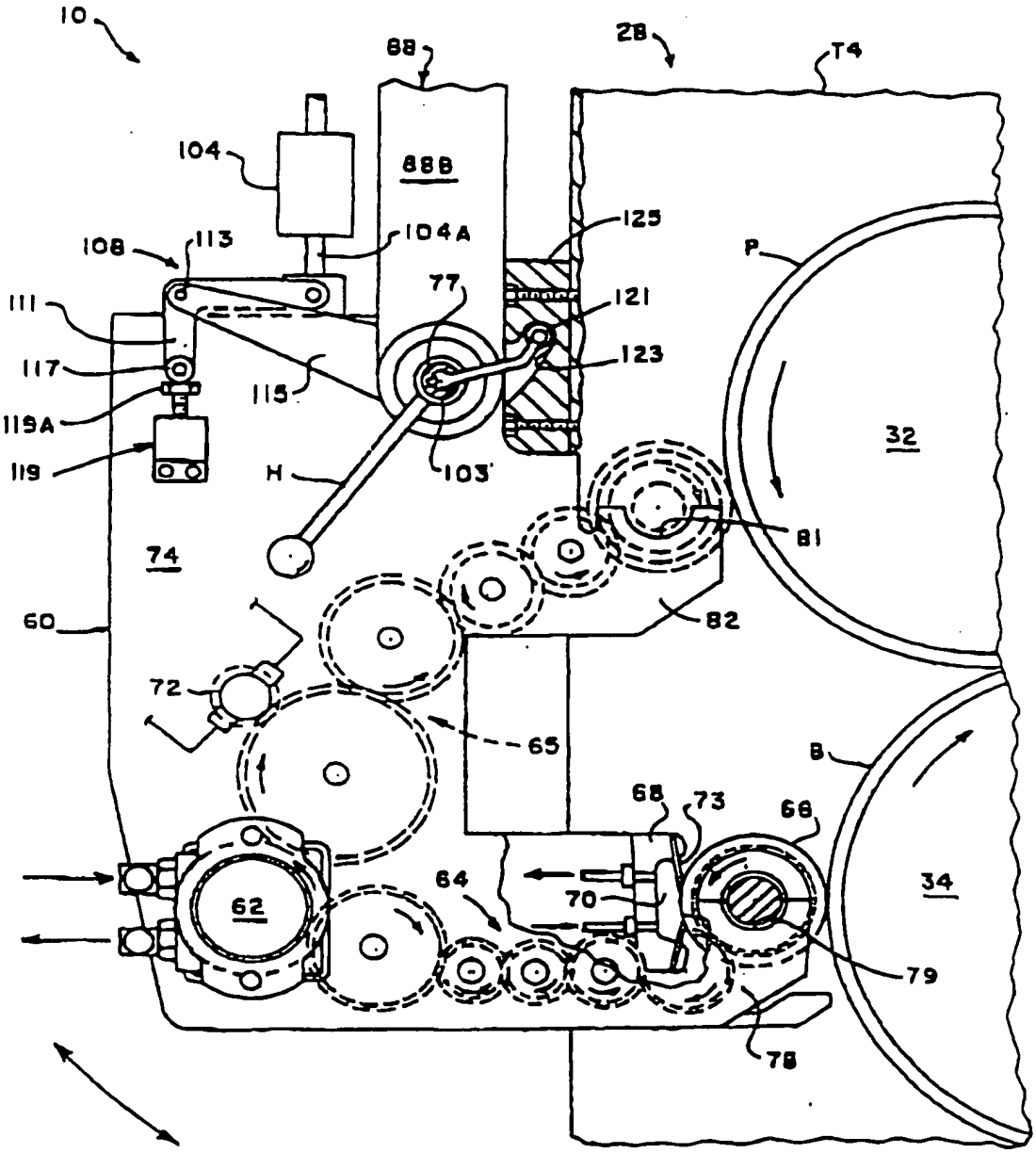

FIG. 6